TOPFLYtech **PioneerX 101** Vehicle GPS Tracker

User Manual

20240129

Contents

Document Purpose

The purpose of this user manual is to provide information about the TOPFLYtech PioneerX 101 vehicle tracking device. It covers the main features of the device and instructions for its use.

TOPFLYtech may make changes to the specifications and features of this manual without prior notice.

Legal Information

Document Version and History

20240129	First version

Safety Information

The following information is provided to ensure safe operation of the device. Please read

them carefully before starting to use the device:

- Do not disassemble the device. If the device case is damaged or the insulation of the wires is compromised, disconnect the power cables from the power supply first.
- It is important to remember that all wireless data transmission devices generate interference that can affect other devices nearby.
- Installation or dismantling of the device should only be carried out by qualified personnel.
- The device must be securely fixed as described in the installation instructions.
- Configuration must be carried out using a second safety class computer with an independent power supply.
- Ensure that the device is installed in a location that is protected from adverse environmental conditions for long periods.
- Dispose of used batteries in accordance with environmental regulations.
- For configuration, use quality, certified cables. TOPFLYtech accepts no liability for damage or loss resulting from the use of unsuitable cables.
- Caution! Do not incorrectly connect the wires marked red (positive power supply) and black (negative/chassis) to the wrong poles of the battery. The device has reverse polarity protection, but if connected improperly, the device will not work.
- Disconnect the device from the power supply before inserting or replacing the SIM card.
- To disconnect the device from the power supply, you need to unplug the device's 6-pin connector or disconnect the wires from the vehicle's power supply.
- Make sure that the cross-sectional area of the wires is at least 18 AWG (0.75 mm^2).
- Use good splicing techniques as crimping or soldering.
- Install the device in a restricted-access location that is not visible or easily accessible to the driver.
- Waste from the equipment must not be disposed of with household waste. The product must be sent to specific collection points at the end of its useful life.

Acronyms and abbreviations

2G - Second generation cellular technology
3G - Third generation cellular technology
4G – Fourth generation cellular technology
AC/DC - Alternating current/Direct current
AIN - Analog input
APN - Access point name
CAN - Controller area network
DIN - Digital input
DOUT - Digital output
FMS - Fleet management system

FW - Firmware
HDOP - Precision horizontal dilution
GLONASS - Global Navigation Satellite System
GMT - Greenwich Mean Time
GNSS - Global Navigation Satellite System
GPRS - General Packet Radio Service
GPS - Global Positioning System
GSM - Global System for Mobile Communications (2G)
IP - Internet protocol (address)
OBD - On-board diagnostics
OTA – Over-the-air
LED - Light Emitting Diode
LTE - Long Term Evolution
PCB - Printed Circuit Board
SMS - Short Message Service
SW - Single-Wire or Software or Switch
TCP - Transmission Control Protocol
UDP - User Datagram Protocol
UMTS - Universal Mobile Telecommunications System
USB - Universal Serial Bus
VCOM - Virtual communication port

Reference Material

Command list: Can be found at the DMS (Device Management Platform)
Protocol description: Contact TOPFLYtech support for detailed protocol information

About this device

TOPFLYtech's PioneerX 101 compact telematics device is a versatile GNSS-based tracker designed for a wide range of fleet management, tracking, security and safety functions.

The PioneerX 101 incorporates GNSS, LTE and Wi-Fi technologies, enabling the precise collection of the device's coordinates and the efficient transfer of this data via the LTE network to the server. This provides customers with cost-effective and secure management. Its rugged and compact IP67-rated enclosure (except PN:04) has made it a popular choice in a variety of sectors, including commercial transportation, corporate fleet management, logistics, car rental, heavy machinery, shipping and more.

The PioneerX 101 has inputs and outputs that can be used for functions such as ignition detection, relay control, siren activation, SOS button and the connection of customized accessories. In addition, its compatibility with BLE sensors makes it possible to monitor temperature, humidity, door status and other relevant information. It is a complete model that meets the diverse needs of customized solutions.

FOTA (firmware over the air) Notification

TOPFLYtech is dedicated to ensuring that its clients enjoy the most seamless and user-friendly experience with its products and services. To achieve this, we have introduced automatic firmware updates for all our devices. This feature is designed to keep your devices up to date by automatically installing the latest firmware versions. It has been integrated to not only enhance the performance of your devices but also to save you the time and effort required for manual firmware updates.

However, we understand that there may be cases where you prefer to have more control over when and how firmware updates are applied to your devices. If you wish to turn off this automatic feature for any reason, you have the option to do so. To disable automatic firmware updates, contact TOPFLYtech, and our support team will assist you in this process.

Once you've disabled the automatic firmware update feature, please note that the responsibility for keeping your device's firmware up to date will fall on you. In such cases, firmware updates can only be performed by sending manual upgrade commands to your device. This ensures that you have full control over the update process and can apply firmware updates at your discretion.

Product Specifications

Network Specifications	
Operating Band	LTE FDD Cat 1: B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B18/B19/ B20/B25/B26/B28/B66 LTE TDD Cat 1: B34/B38/B39/B40/B41 GSM (2G): 850/900/1800/1900 MHz
Data Transmission	LTE-FDD: Max.10 Mbps (DL), Max.5 Mbps (UL) LTE-TDD: Max.8.96 Mbps (DL), Max.3.1 Mbps (UL) GPRS: Max. 85.6 Kbps (DL), Max. 85.6 Kbps (UL)
GNSS Specifications	
GNSS Chipset	All-In-One GNSS receiver
Parallel GNSS	GPS + Beidou + Galileo + QZSS （SBAS）
Receiver type:	24 tracking / 64 acquisitions- channel GNSS receiver
Sensitivity	Acquisition: -148 dBm Reacquisition: -159 dBm Tracking: -162 dBm
Horizontal Position Accuracy	Autonomous: < 1.5 m CEP
TTFF @ -130 dBm with (without) EASY™	Cold Start: < 20s (30s) Warm Start: < 2 (2s) Hot Start: < 2s (2s)

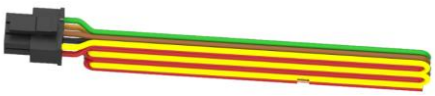
Interfaces					
Models	**PN:01**	**PN:02**	**PN:03**	**PN:04**	**PN:05**
Digital Input*	-	2	1	1	1
Digital Output	-	1	1	-	1
Configurable Input (Digital/Analog/ Neg Trigger) *	-	2	-	-	-
1-Wire Power 3.3V DC	-	-	1	-	-
1-Wire Data	-	-	1	-	-
RS232 Power 5V DC	-	-	-	1	-
RS232 TX	-	-	-	1	-
RS232 RX	-	-	-	1	-
CAN-H	-	-	-	-	1
CAN-L	-	-	-	-	1
Battery	Li-Polymer 200mAh/ 3.7V	Li-Polymer 200mAh/ 3.7V	Li-Polymer 200mAh/ 3.7V	Li-Polymer 300mAh/ 3.7V	Li-Polymer 200mAh/ 3.7V
IP Rating	IP67	IP67	IP67	IP41	IP67
*For ignition detection (input range 0-32V, 5≤: ignition on, ≤2V ignition off, from 2V to 5V: unstable status) *Can be configured to digital input or analog input (0~32V) or negative trigger input					

General Specifications	
Dimensions	102.6 x 42.6 x 13.0 mm (4.04” x 1.67” x 0.51”)
Weight	50g (2.47oz)
Operating Voltage	7~100V DC
Operating Temperature	-30°C ~ +80°C (-22°F ~ 176°F)
Storage Temperature	-40°C ~ +85°C (-40°F ~ 185°F)
Internal Memory	8MB
General Features	
Operating Voltage	7V to 100V DC
Network, GNSS, BLE, WiFi Antenna	Internal only
Indicator LED	Network and GNSS
FOTA	Yes
Temperature Sensor	Internal temperature sensor
BLE 5.0	Yes
WiFi	2.4 GHz 802.11b (Rx)

Tracker Configuring	Type-C Connector
Waypoints	40,000 Waypoints
Air Interface Protocol	
Transmit Protocol	TCP, UDP, MQTT, SMS
Protocol Check & Encryption Support	MD5/ AES256
BLE Accessory Support	Yes
Scheduled Timing/angle/distance Report	Report position and status at preset intervals
External Power Status Alarm	Report when external power is disconnected
Low Power Alarm	Report when backup battery is low
Speeding Alarm	Report when speed exceed the pre-set value
Towing Alarm	From internal 3-axis acceleration
Remote Control	Remote output control
Network Signal Jamming Detection	Report network jamming
Data Roaming Control	Avoid additional data consumption
Driving Behavior Monitoring	Aggressive driving behavior detection, e.g., harsh braking and acceleration
Crash Detection	Accident data collection for reconstruction and analysis

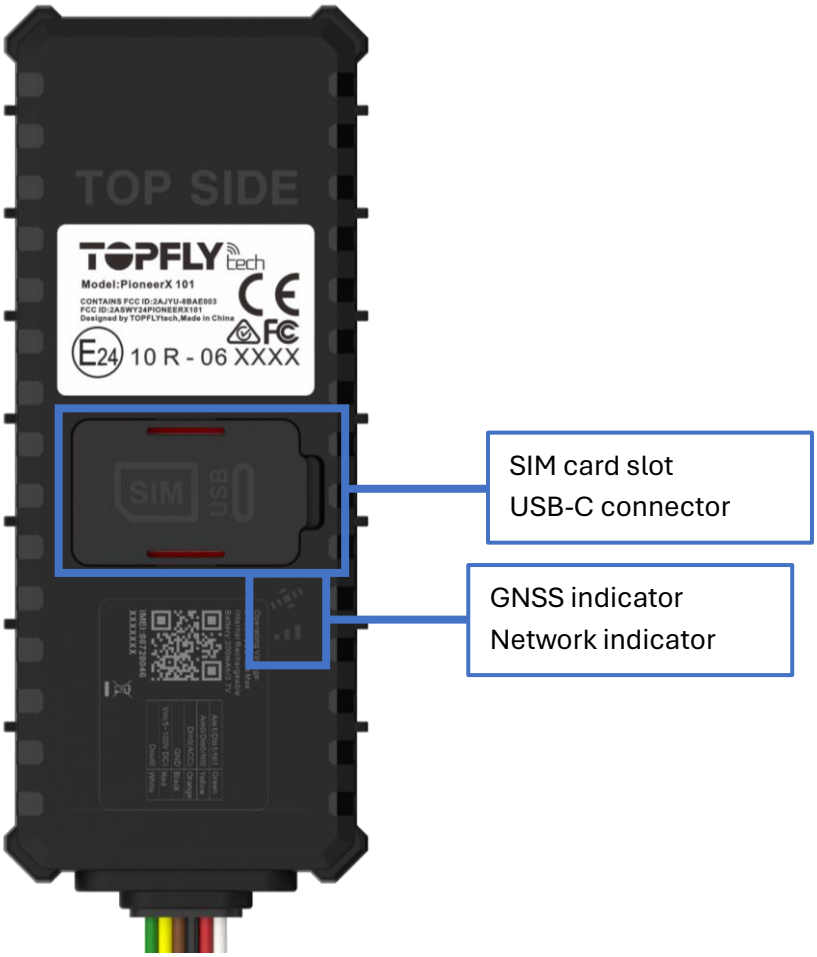
Package contents

Foam double-side adhesive tape



Electrical harness (500mm)

Product overview



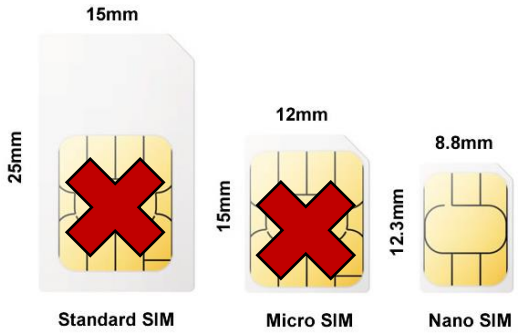
Note: The indicator lights will go out automatically after the tracker is powered for 8 mins, unless configured to be always on.

Individual device ID

Every PioneerX 101 has a laser engraved table containing important information as operating voltage, battery capacity, IMEI number both human readable and in a QR code format and wire definition.

SIM Card

The PioneerX 101 is compatible with SIM cards in the Nano format. To ensure proper operation, make sure that the SIM card's data plan is enabled, that no PIN code is set and that there is sufficient balance. If you plan to use SMS commands to setup the device, make sure the SIM card plan has SMS enabled.



To insert the SIM card, follow the steps below:

- Make sure the device is **disconnected** from any power source (vehicle battery or USB cable). If SIM card is installed in a running device, the REBOOT command has to be sent.
- Remove the SIM card cavity cover in order to expose the USB-C connector.
- Move the latch of the cradle to the unlocked position
- Insert the SIM card into the cradle.
- Move the cradle latch to the opposite side, locking the SIM card in place.
- Reinsert the device's cover.

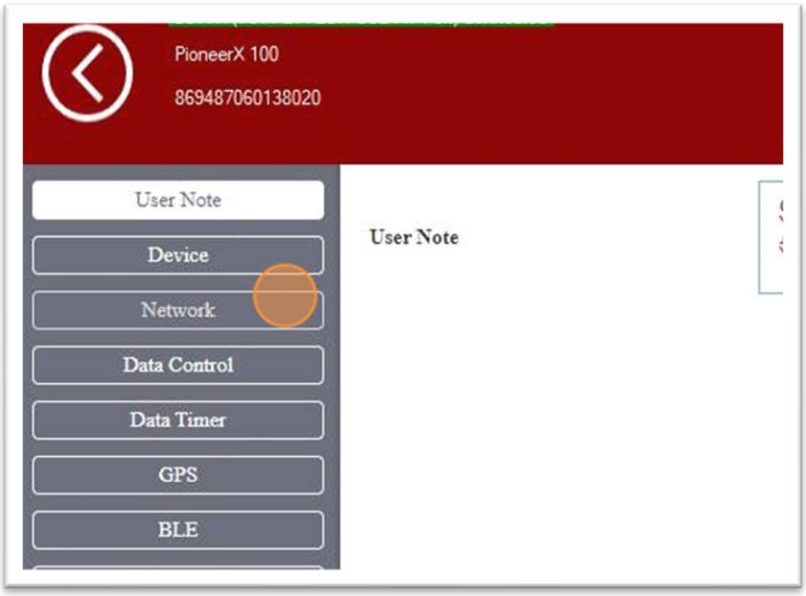
Your device is now ready for configuration.

Configuring the device

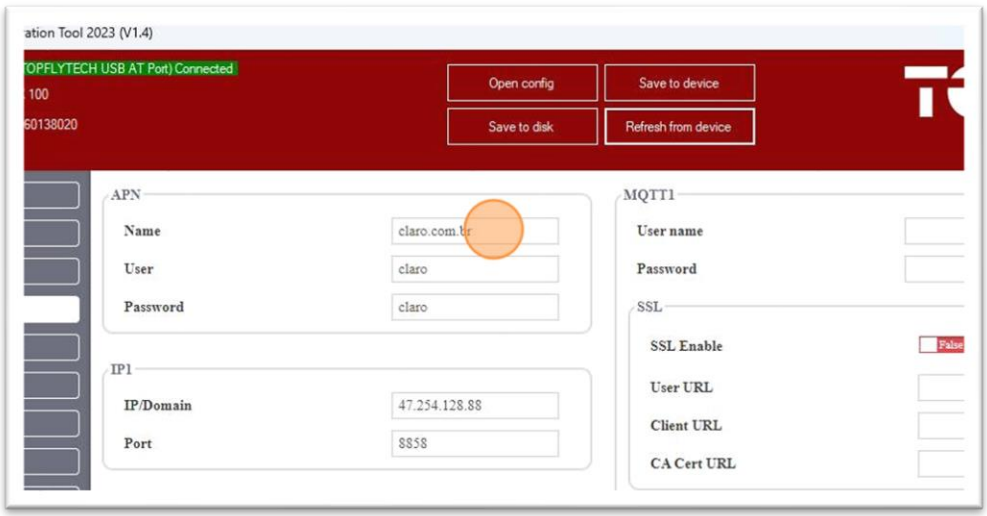
Configuration software

Before starting, make sure you have installed all the necessary USB drivers.
Drivers can be downloaded from our FTP server. Contact TFT Support if you cannot find them.

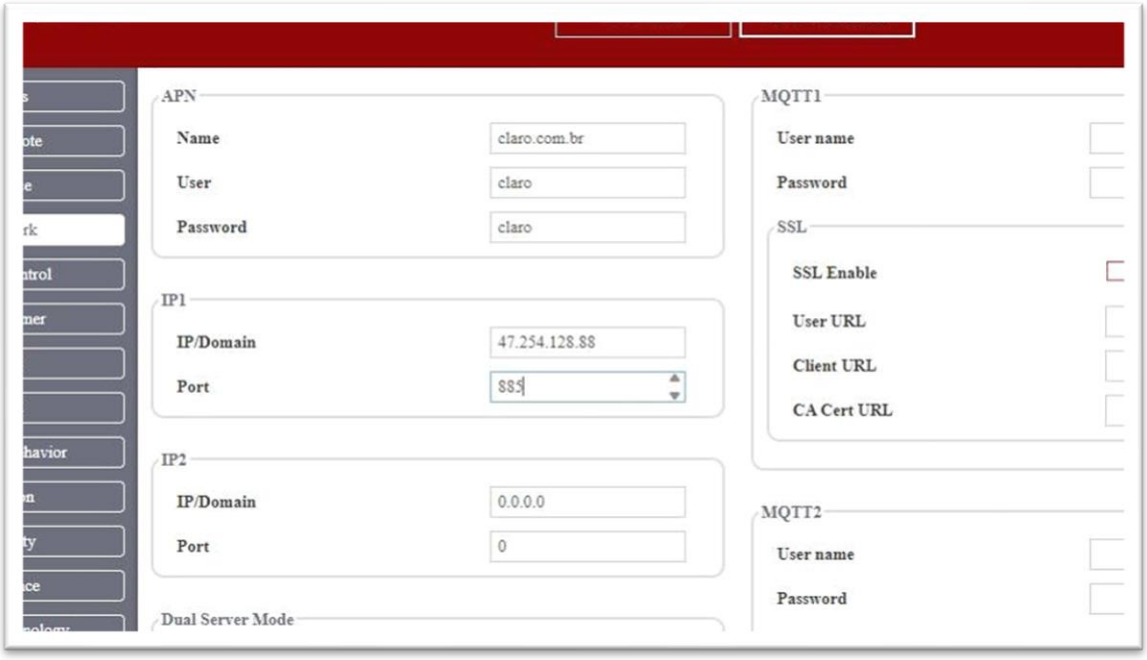
1. Go to the "Network" tab:



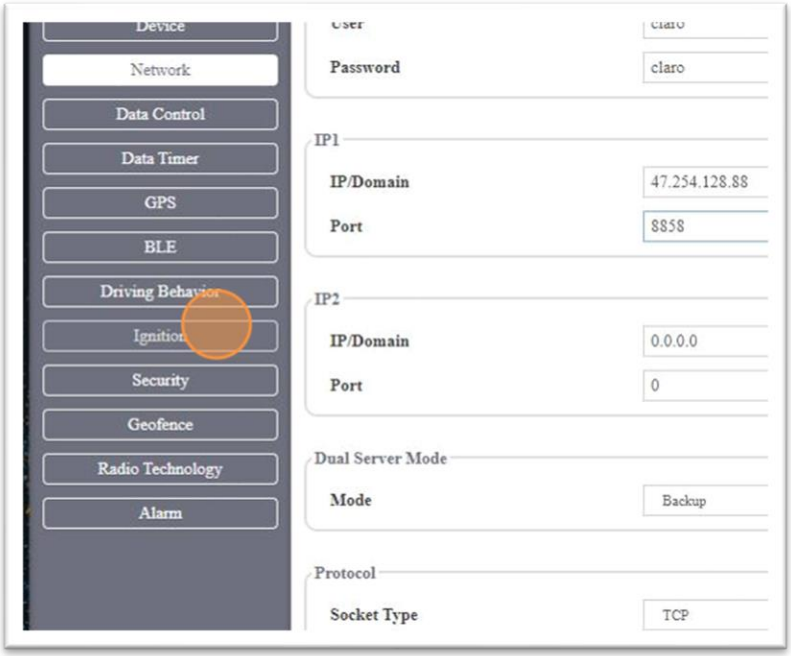
2. Type your APN information (Claro as an example)



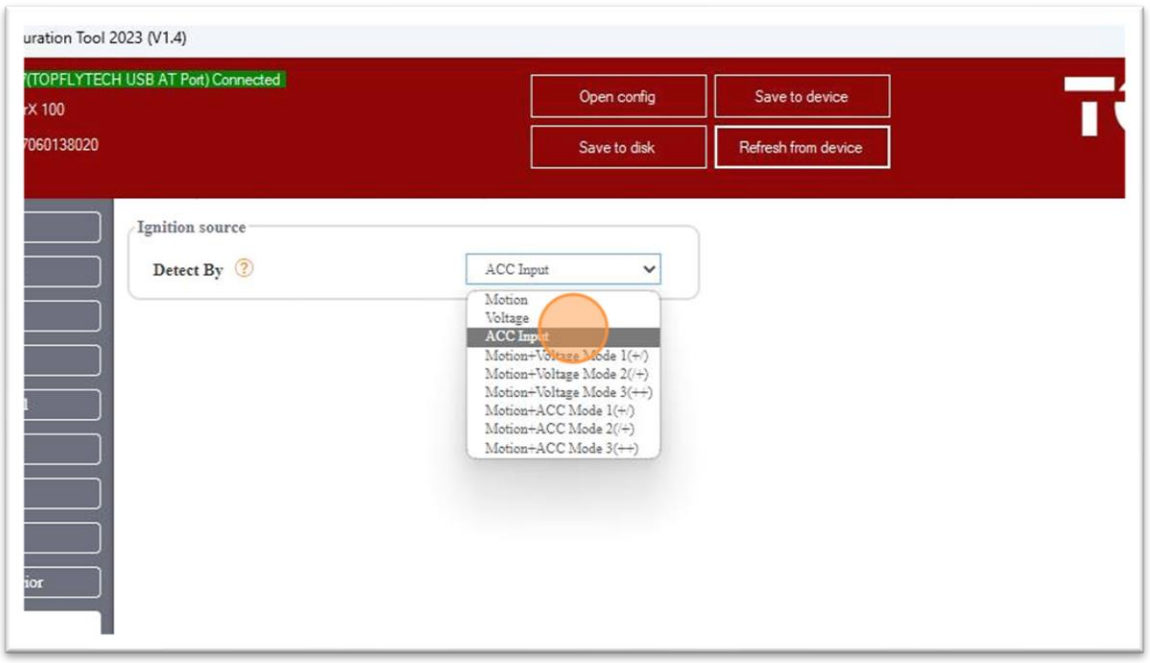
3. Type your Platform IP and port (TFT Monitor as an example)



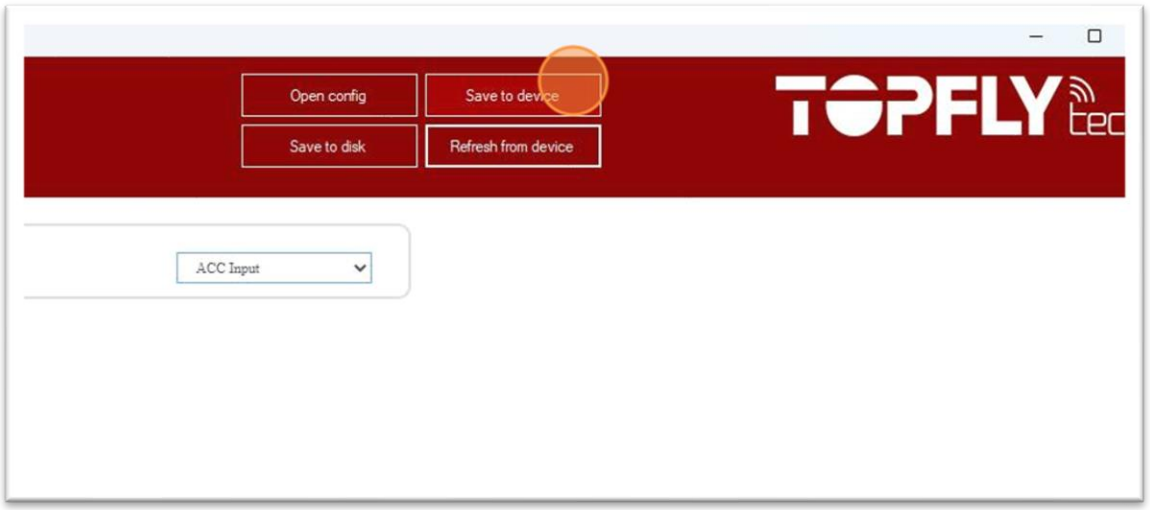
4. Go the "Ignition" tab:



5. Select your ignition detection procedure:



6. Click "Save to device"



7. Click on "yes"

8. Close the configuration tool when the upload is complete. The device will reboot and will have the correct configuration installed.

Using commands

Send the following command via serial console or SMS to set up the device APN:

APN,<password>,APN_name,username,password#

If there is no need of password:

APN,<password>,APN_name,username,#

If there is no need of user name and password:

APN,<password>,APN_name,,#

Use the following command to set IP address:

IP,<password>,ip_address,port#

In this case both IP and domain name are acceptable.

Default password is 0000.

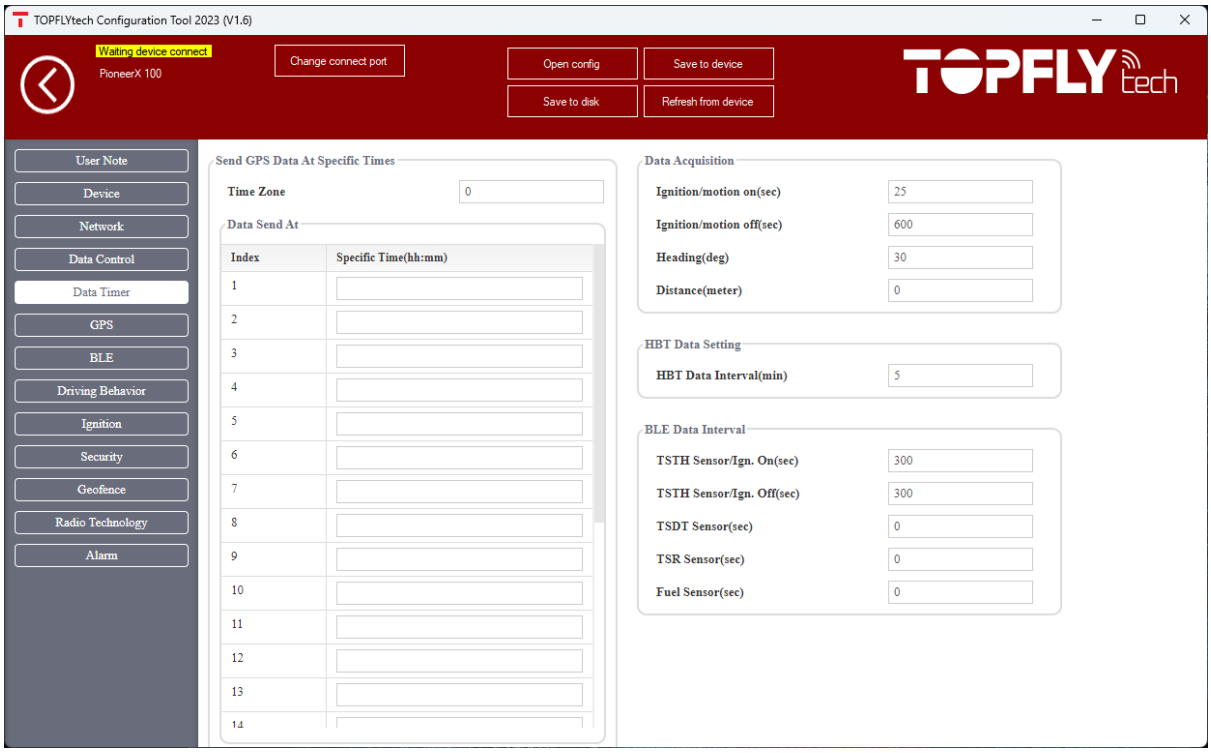
Setting data timer

Data timer are the intervals of which the device will send location/sensor messages to the server.

Using the Configuration tool

In the Data timer tab, set the Data Acquisition values.

1. Ignition/motion on: tracker reports every A seconds when ignition is on (range is 0 or 3~65535. 0 means disable)
2. Ignition/motion off: tracker reports every B seconds when ignition is off (range is 0 or 3~65535. 0 means disable)
3. Heading: tracker reports when the vehicle turns every C degrees (range is 0~180, 0 means disable)
4. Distance: tracker reports when the vehicle runs every D meters (range is 0~65535, 0 means disable)



On the same screen the user can set the interval to send BLE sensor data to the server, and the Heartbeat interval.

Using commands

Send the following command via serial console or SMS:

TIMER,<0000>,A:B:C:D#

Where:

5. A, tracker reports every A seconds when ignition on (range is 0 or 3~65535. 0 means disable)
6. B, tracker reports every B seconds when ignition off (range is 0 or 3~65535. 0 means disable)
7. C, tracker reports when the vehicle turns every C degrees (range is 0~180, 0 means disable)
8. D, tracker reports when the vehicle runs every D meters (range is 0~65535, 0 means disable)

Changing the default password

There are 2 ways to change the device's default password.

Using commands

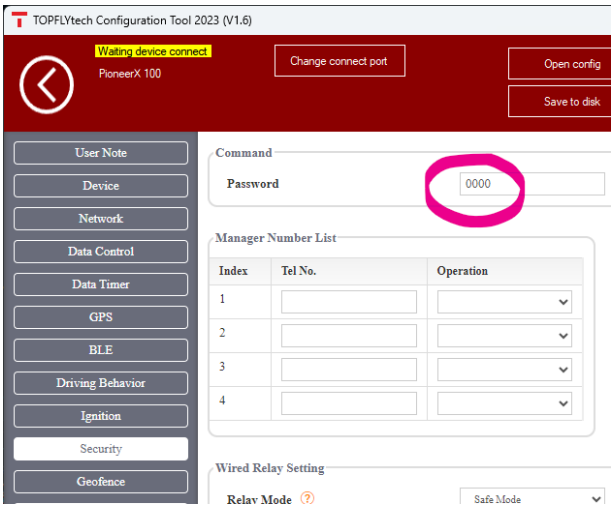
Send the following command via serial console or SMS:

PASSWORD,<0000>,<new_password>#

The new password can have up to 10 alphanumeric characters.

Using the configuration tool

When configuring the device, on the security tab the user can set the desired password.



Forgotten password?

If the user has forgot the device's password, the "MYSELF#" command can be sent to the device in order to retrieve the current password.

NOTE: If a manager phone number has been set, only this number can use this command if sending via SMS. If the command is sent via serial console or SMS with no manager setting, the tracker will return the device IMEI and current PIN.

Wi-Fi positioning

If enabled the device will scan for available Wi-Fi networks and send the router's MAC address back to the platform using the 0x250x250x15 protocol messages. It's the platform's role to have a database crossing MAC address to location.

To enable, use the command:

```
WIFILOC,<password>,1#
```

To disable:

```
WIFILOC,<password>,0#
```

Default password is 0000.

Sending commands via network (TCP/UDP/MQTT/DMS)

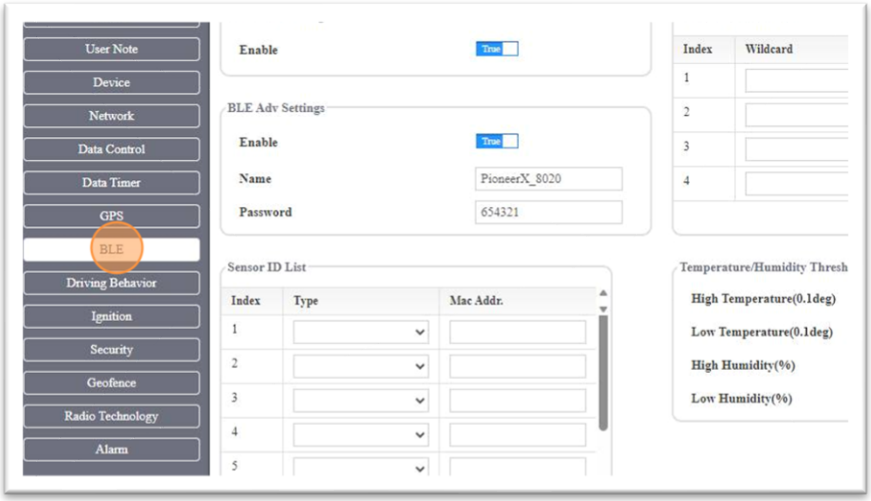
If the user is sending commands to the device via the platform instead of SMS or serial console the password is not needed. Remove the "<password>," from the command before sending. More information is available in the Command List in the DMS.

Bluetooth accessories

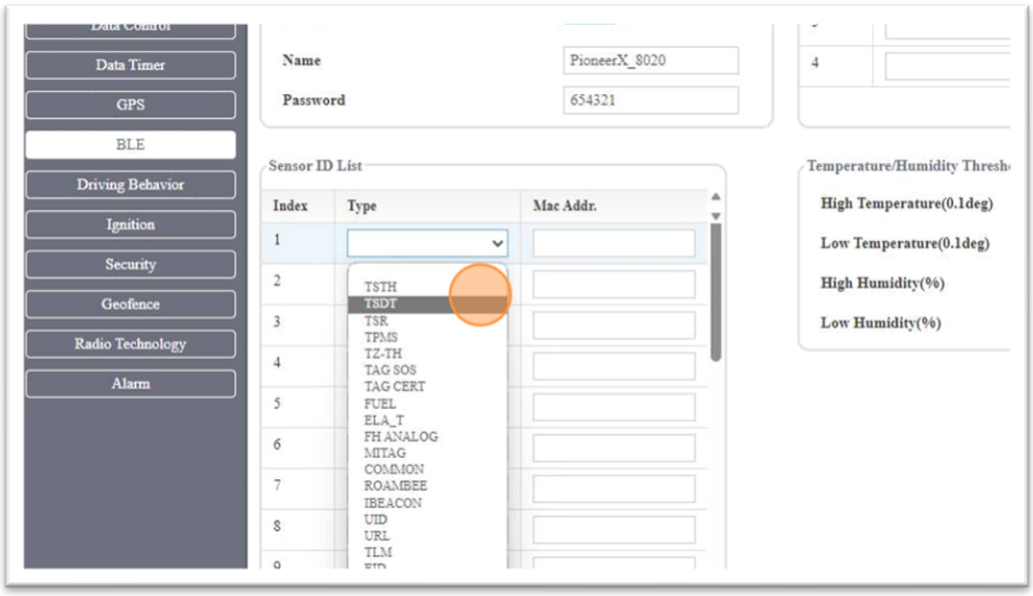
Using the configuration tool

TOPFLYtech devices

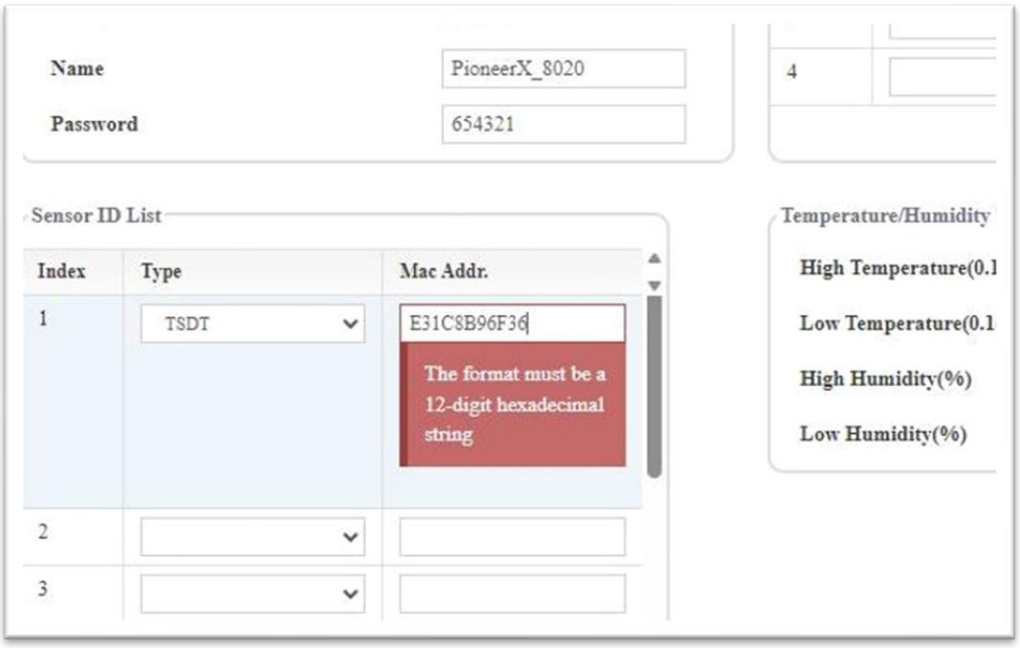
1. On the device configurator, go to the "BLE" tab



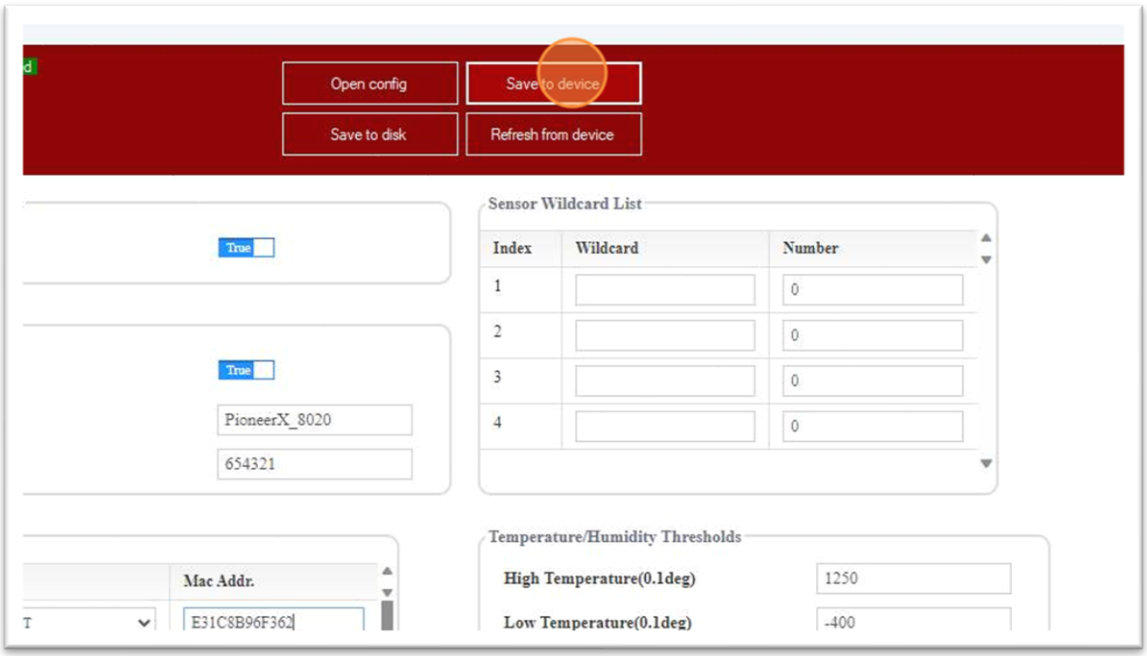
2. Select the type of the device you want to pair:



3. Type the device MAC address

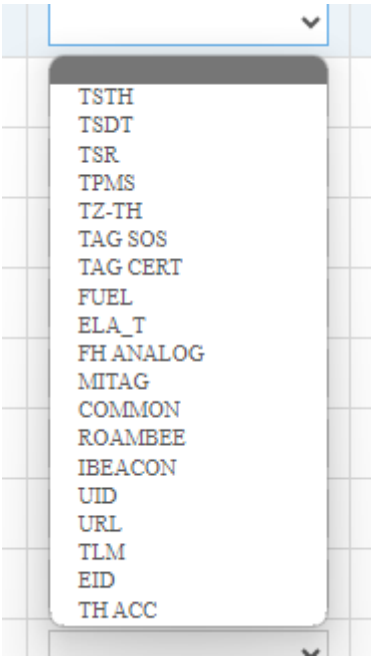


4. Click "Save to device"



Bluetooth device types

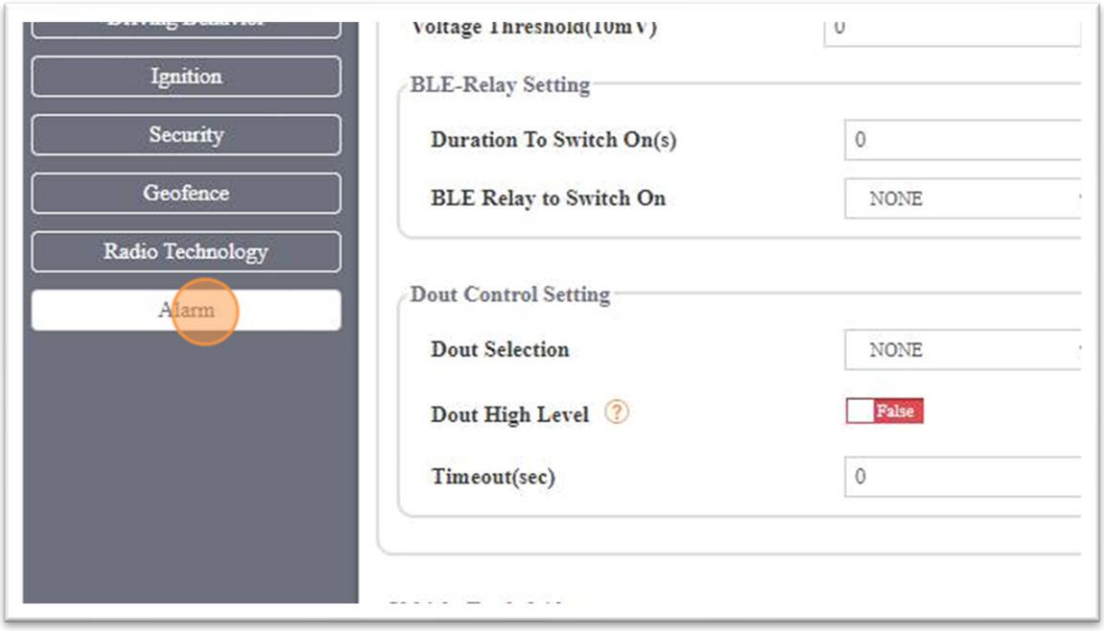
- TSTH = TFT Temperature and Humidity BLE sensor
- TSDT = TFT Door and temperature BLE Sensor
- TSR = TFT BLE Relay
- TPMS = Tire pressure monitoring Sensors
- TZ-TH = T-Zone Temperature and Humidity sensor
- Tag Cert = Driver ID button (T-Button)
- Tag SOS = Panic button (T-Button)
- Fuel = ESCORT fuel sensor
- ELA_T = ELA Temperature Sensor
- Common = BLE Passthrough mode (transparent channel)
- iBeacon = Apple iOS iBeacon protocol
- UID, URL, TLM, EID = Eddystone Protocol
- TH Acc = T-Hub ACC detection



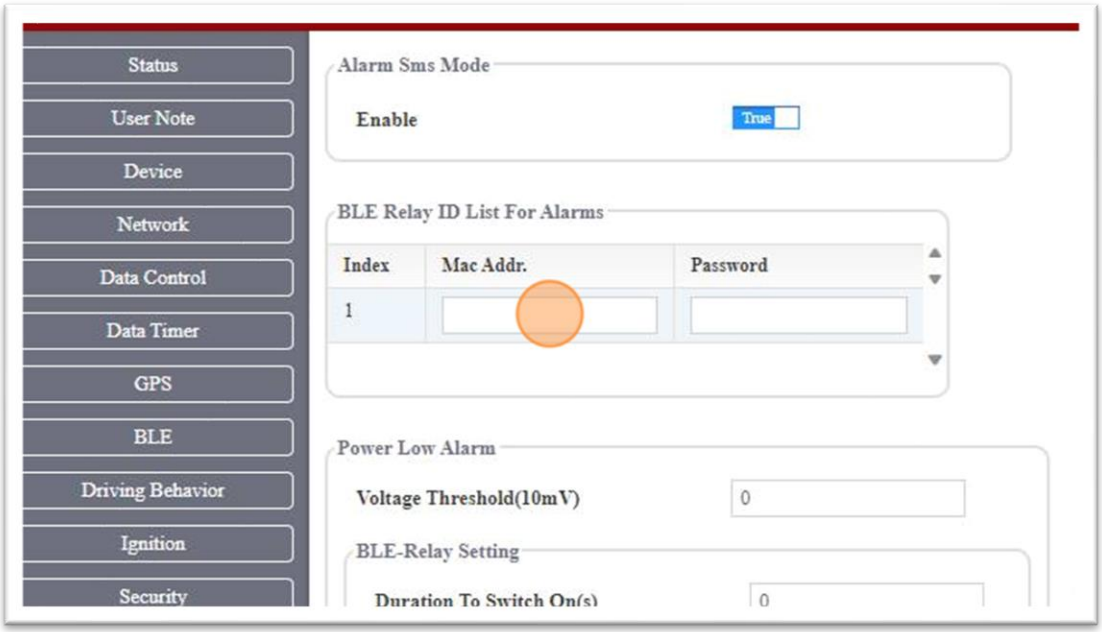
TOPFLYtech BLE relay

The PioneerX 101 can be connected to one TFT BLE relay and control it following the Alarm settings or received commands.

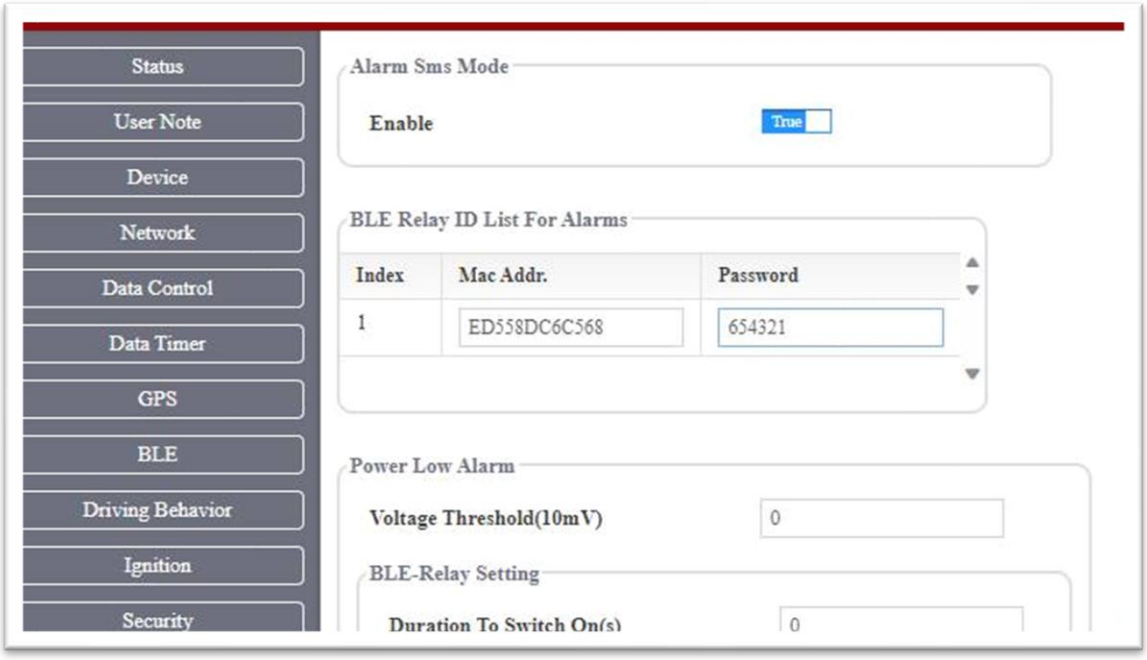
1. Open the "Alarm" tab



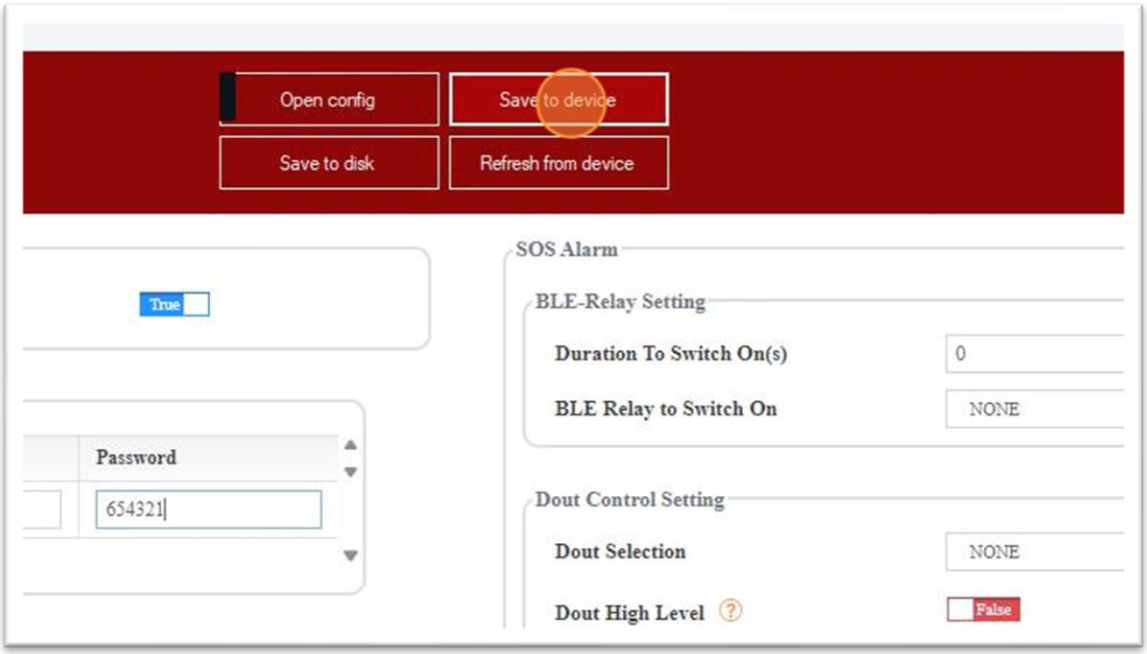
2. Type the BLE relay MAC address



3. Type the BLE relay password



4. Choose which alarm will activate the BLE relay and its timeout. “0” means no timeout.
5. Click "Save to device"



Vehicle Installation

1. Positioning the device:

- When installing the tracking device, make sure that the label is facing upwards, pointing towards the sky. Avoid any metal obstructions between the device and the sky.
- The internal GNSS antenna is sensitive to its orientation. Any incorrect position will affect tracking accuracy.
- You can tilt the device by up to 45 degrees on any axis, but the top must remain facing upwards.
- Install the device behind the dashboard, in an inconspicuous place and as close to the windshield as possible.
- Avoid installing it near metal surfaces, moving parts or heat sources.
- Secure the device to the vehicle with cable ties or double-sided tape and make sure it is firmly fixed. This is especially important if the Driving Behavior feature is being used.

2. Connecting to the power supply and ignition:

- Make sure that the device is connected to the power supply and the ignition source configured for ignition detection. Turn on the vehicle's ignition and check that the device responds.

3. Test and verification:

- After installation, test the device using the Configuration Tool status tab and the tracking platform. Check that all the data is being received and properly interpreted before finalizing the installation.

These steps will ensure proper installation and effective operation of your tracking device. If you have any questions or need further assistance, contact our support team.

Simple troubleshooting

- Inability to Connect to the Tracking Platform
  - Check the APN and IP settings.
  - Check that the SIM card supports the specific network and that the data service is enabled.
  - Make sure there are no limitations or that the server's IP address has already been added to the IP whitelist when using an M2M SIM card.
  - Check the remaining balance or network signal of the SIM card.

- Make sure the IMEI is correctly added to the platform.
- Check ACK setting for the Login message.

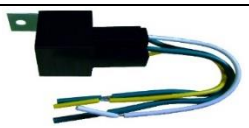
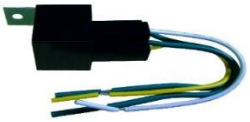
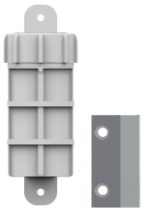
- Tracker Indicates Offline
  - Check the voltage of the external power source to see if the tracker has been disconnected from the external power source.
  - Check if the vehicle has entered a network shadow area.
  - Check the tracker's SIM card balance.
  - If the disconnection occurred in the last few days of the month, check whether the network service has been interrupted by the operator due to exceeding the maximum data usage volume.
  - Make sure the IMEI is correctly added to the platform.
  - Check ACK setting for the Login message.
- Unable to locate
  - Check that the top side (with the TOP SIDE logo) is facing upwards without being covered by metal objects during installation.
  - Has the vehicle entered an area without satellite coverage?
- Location deviation
  - In areas with a weak GNSS signal (such as areas with many tall buildings), location drift can occur. When you move to an open area, the drift will no longer occur.
- Lack of response to commands
  - Check the format of the command. Make sure it is correct.
  - The vehicle may be in a network shadow area.
  - Make sure the device is online or wait for it to become online.

Warranty and stocking

The standard warranty for our product lasts for 12 months starting from the date of purchase. To ensure the longevity of your tracker, especially if you plan to store it for an extended period, we recommend a specific maintenance procedure.

If you anticipate leaving the tracker unused for a while, it's advisable to connect it to an external power source and recharge the internal battery for a continuous period of 10 hours every 3 months. This proactive measure will significantly contribute to preserving the lifespan of the internal battery.

Optional TFT Compatible Accessories List

TA01	General Purpose Relay (12V)	
TA11	General Purpose Relay (24V)	
TA20	External TPS Set (BLE)	
TA22	Internal TPS Set (BLE)	
TSTH1-B	BLE 5.0 Wireless Temperature & Humidity Sensor	
TSDT1-B	BLE 5.0 Wireless Door & Temperature Sensor	
TSR1-B	BLE 5.0 Wireless Relay	

TA48	Wired Panic Button (2m)	
T-button	BLE 5.1 Key Fob & Panic button	
T-sense	BLE 5.1 IP67 temperature, movement and door sensor	
T-hub	BLE 5.1 IO extension hub	
T-one	BLE 5.1 Probe temperature sensor	

FCC Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the

receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

Caution!

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IMPORTANT NOTICE:

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

ISEDC Warning

This device complies with Innovation, Science, and Economic Development Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d' Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil nedoit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device is compliance with RF exposure guidelines, users can obtain Canadian information on RF exposure and compliance.The minimum distance from body to use the device is 20cm.

Le présent appareil est conforme Après examen de ce matériel aux conformité ou aux limites

d’intensité de champ RF, les utilisateurs peuvent sur l’exposition aux radiofréquences et la conformité and compliance d’acquérir les informations correspondantes. La distance minimale du corps à utiliser le dispositif est de 20cm.